

Site Specific Test Plan

Williams - Rocky Mountain Midstream, LLC
3601 Stagecoach Road, Suite 202
Longmont, Colorado 80504

Discovery Powhaton Compressor Station
Adams County, Colorado

(2) Caterpillar 3606 Engines (C-210 & C-211)
Performance Test – NO_x, CO, VOC, HCHO

Proposed Test Date: April 9, 2019

AST Project No. 2019-0489D

Prepared By
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Regulatory Information

Permit No.(s) CDPHE Permit 17AD0780
Regulatory Citation(s) 40 CFR Part 60, Subpart JJJJ

Source Information

Source Name	Target Parameter(s)
(2) Caterpillar 3606 4SLB RICE C-210 & C-211 AIRS 007 & 008	NO _x , CO, VOC, HCHO

Contact Information

Test Location	Test Company	Regulatory Agency
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1. Introduction

Alliance Source Testing, LLC (AST) was retained by Rocky Mountain Midstream LLC (RMM) to conduct compliance testing at the Discovery DJ Services LLC operated Discovery Powhaton Compressor Station (CS) located in Adams County, Colorado. The Colorado Department of Public Health and Environment (CDPHE) Construction Permit 17AD0780 and 40 CFR Part 60, Subpart JJJJ requires testing for the facility. Testing will be conducted to determine the emission rates of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC) and formaldehyde (HCHO) from two (2) Caterpillar 3606 natural gas fired engines (C-210 & C-211 / AIRS 007 & 008).

This site-specific test plan (SSTP) has been prepared to address the notification and testing requirements of CDPHE Construction Permit 17AD0780 and 40 CFR Part 60, Subpart JJJJ.

2. Plant Description

The Discovery Powhaton CS (AIRS 001/2176) is a Natural Gas Compressor Station located in SEC 17 T1S R65W in Adams County, Colorado. Three (3) Caterpillar 3606 natural gas-fired, turbo-charged, four stroke lean burn (4SLB) reciprocating internal combustion engines (RICE) (C-210, C-211, C-212 / AIRS 007, 008, 009) and one (1) Caterpillar G3516 natural gas-fired, turbo-charged, 4SLB RICE (C-213 / AIRS 010) are in service for the compression of natural gas. C-210 through C-212 are site rated at 1,875 horsepower (hp) and C-213 is site rated at 1,380 hp. All engines are equipped with oxidation catalyst and air/fuel ratio control (AFRC) for pollutant control. Engines C-210 and C-211 are the subjects of this test program.

3. Process Description

All testing will be performed in accordance with specifications stipulated in U.S. Environmental Protection Agency (EPA) Reference Test Methods (RM) 1, 2, 3A, 25A and 320 referenced in 40 CFR Part 60, Appendix A and 40 CFR Part 63, Appendix A.

At each engine, three, 1-hour test runs will be conducted to determine the emission concentrations of NO_x (NO, NO₂), CO, VOC and HCHO. Concentration data will be combined with concurrently collected oxygen (O₂), carbon dioxide (CO₂), moisture (H₂O) and gas velocity data to determine volumetric flow rate (VFR) and mass emission rates of each analyte in units of pounds per hour (lb/hr) and tons per year (tpy). Mass emissions will be combined with engine operating load to calculate emissions in units of grams per brake-horsepower hour (g/bhp-hr). HCHO emissions will be reported in units of parts per billion, dry volume basis, corrected to 15% O₂ content (ppbvd @ 15% O₂) and pounds per year (lb/yr).

EPA RM 25A will be conducted to measure total volatile organic compounds (TVOC) or non methane organic compounds (NMOC) emission concentrations. Methane and ethane emission levels will be measured with EPA RM 320. Compliance with VOC standards will be demonstrated with EPA RM 25A measurements, excluding the contribution of methane and ethane

The sources will be operating within 10% of peak load or at the highest achievable load during the test program. The engine's operating and control equipment parameters will be recorded throughout the test program by Powhaton CS site personnel for inclusion in the test report, including;

- Catalysts differential pressure (inches of water)
- Catalyst inlet temperature (degrees Fahrenheit)
- Engine load (bhp)
- AFR readings

Source identification and permitted emission limits are summarized in Table 1.

Table 1
Source Identification

Source Identification	Emission Standards for Required Testing
(2) Caterpillar 3606 4SLB RICE C-210 & C-211 AIRS 007 & 008 SN: JFE00914 & JFE00818 Capacity: 1,875 hp	NO _x : 1.0 g/bhp-hr, 9.1 tpy CO: 2.0 g/bhp-hr, 2.7 tpy VOC: 0.7 g/bhp-hr, 5.4 tpy HCHO: 724 lb/yr (emission factor only)

4. Permits and Regulations

The data collected during the test program will be used to determine the compliance status of the units with respect to applicable CDPHE Construction Permit 17AD0780 and 40 CFR Part 60, Subpart JJJJ requirements.

5. Stack Schematic

The stack diameter, upstream and downstream disturbance distances and nipple lengths will be measured on site with a verification measurement provided by the Field Team Leader. Table 2 provides source identification, stack dimensions and the number of gas velocity sampling points. RM 2 sampling points will be in accordance with RM 1. A stratification test will be conducted to determine RM 3A sampling points. RM 25A and 320 will be conducted from a single point.

Table 2
Sample Location Summary

Source Identification	Diameter (inches)	Port Location to Nearest Disturbance	Traverse Points
(2) Caterpillar 3606 4SLB RICE C-210 & C-211 AIRS 007 & 008	15.75"	Upstream: > ½ D Downstream: > 2D	16

6. Methods

All testing will be performed in accordance with specifications stipulated in EPA RM 1, 2, 3A, 25A and 320. The emissions testing program will provide all necessary equipment and labor for the determination of all emissions parameters detailed in Table 3. Gas analyzers will be housed in a mobile, analytical trailer to provide a temperature-controlled environment for stable, accurate analyzer response.

Table 3
Sampling and Analytical Methods

Parameter	EPA RM	Analytical Method
VFR	1, 2	Full Velocity Traverses
O ₂ , CO ₂	3A	Instrumental Analysis
TVOC / NMOC	25A	Instrumental Analysis
H ₂ O, NO _x , NO, NO ₂ , CO, VOC, HCHO, methane, ethane	320	Instrumental Analysis / Fourier Transform Infrared (FTIR) spectrometer

6.1. U.S. EPA Reference Test Methods 1 and 2 - Stack Gas Velocity and Volumetric Flow Rate

Stack gas velocity and volumetric flow rate will be measured in accordance with EPA RM 1 and 2.

The sampling location and number of traverse points will be selected in accordance with EPA RM 1. To determine the minimum number of traverse points, the upstream and downstream distances will be equated into equivalent diameters and compared to Figure 1-2 in EPA RM 1.

Full velocity traverses will be conducted in accordance with EPA RM 2 to determine the stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system will consist of a pitot tube and inclined manometer. The stack gas temperature will be measured with a K-type thermocouple and pyrometer. The pitot assembly will be leak checked pre and post each sampling period.

The temperature and differential pressure traverse data will be combined with concurrently collected diluent data to calculate the stack gas velocity and volumetric flow rate in units of feet per second (ft/sec), actual cubic feet per minute (acfm), dry standard (1 atmosphere and 68°F) cubic feet per minute (dscfm), and pounds per hour (lb/hr).

6.2 U.S. EPA Reference Test Method 3A – Oxygen and Carbon Dioxide

O₂ and CO₂ emission concentrations will be measured in accordance with EPA RM 3A.

Each sampling period will consist of extracting a gas sample from the stack at a constant flow rate of approximately two liters per minute (lpm). The sample will pass through a refrigeration-type gas conditioner to remove moisture and into the sampling port of a Servomex Series 1400 paramagnetic O₂ / non-dispersive infrared CO₂ analyzer. The gas concentrations will be displayed on the analyzer front panels in units of percent, dry volume basis (%vd – O₂ and CO₂) and logged to a computerized data acquisition system (CDAS).

The initial three-point calibration test for each species will be conducted in direct calibration mode. Before and after each sampling period, the sample system will be challenged with calibration gases for a system bias check, and to quantify zero and span drift for the previous sampling period. The calibration gases will be prepared and certified in accordance with EPA Protocol 1.

The initial 3-point calibration error must be less than ±2% of the calibration span gas (CS). The sampling system bias recorded during the performance test must be less than ±5 percent of the CS. The zero and span calibration drift must not exceed ±3 percent of the CS over the period of each run. If the bias values exceed the specified limits, the

run is void. If the drift values exceed the specified limits, the results will be reported using pre and post run calibration data. In both cases, another 3-point calibration and 2-point bias verification must be passed before the next run.

Prior to sampling, the stratification test procedures outlined in Section 8.1.2 of EPA RM 7E will be performed to determine the appropriate sampling points on stacks larger than 6 inches. The stratification test will be conducted using a single analyte of interest (O₂ or CO₂) along three (3) points (16.7%, 50.0%, and 83.3% of the stack diameter) passing through the centroidal area of the stack. If the stack gas is not stratified (concentrations are within +/- 5% or +/- 0.5 ppm of the mean concentration), a single measurement point will be selected.

Following sampling, the CDAS data will be averaged in one-minute increments, corrected for instrumental drift, and reported as average O₂ and CO₂ emission concentrations for each sampling period in units of %vd.

6.3 U.S. EPA Reference Test Method 25A – Volatile Organic Compounds

TVOC concentrations will be measured in accordance with EPA RM 25A using a hydrocarbon analyzer. If the hydrocarbon analyzer is equipped with a methane separator NMOC concentrations will be measured.

Each sampling period will consist of extracting a hot, wet gas sample from a single centrally located point in the stack at a constant flow rate of approximately two liters per minute using a heated Teflon line. The gas will be directed into a column of the Thermo Model 51i (TVOC) or 55C (NMOC) flame ionization analyzer. VOC concentrations will be displayed on the analyzer front panel in units of parts per million, wet volume basis (ppmvw – as propane) and logged to a CDAS.

Prior to sampling, the analyzer will be challenged with the zero and high-level EPA Protocol 1 calibration gases to linearize the instrument. Then the low and mid-level calibration gases will be introduced through the sampling system. The sampling system is acceptable, if the linear relationship between the zero and high-level calibration gases predict the low and mid-level calibration gas measurement system response within 5% of the respective calibration gas value. The time required for the analyzer reading to reach 95% of the high-level gas concentration will be recorded to determine the response time of the sampling system.

After each sampling period, the measurement system will be challenged with the zero and mid-level calibration gas. If the analyzer drift exceeds 3% of the analyzer span, then the system will be re-linearized with the zero and high-level calibration gases, and the measurement system verified with the low and mid-level calibration gases. If the drift limits are exceeded, the results will be reported using both sets of calibration data.

Following sampling, the CDAS data will be averaged in one-minute increments, corrected for instrumental drift, and reported as average emission concentrations for each sampling period. The concentration data will be combined with concurrently collected flow data to calculate VOC emissions as propane in units of lb/hr and g/bhp-hr.

6.4 U.S. EPA Reference Test Method 320 – H₂O, NO_x, NO, NO₂, CO, VOC, HCHO, Methane & Ethane

NO_x, NO, NO₂, CO, VOC, propane, HCHO, methane, ethane, ethylene, propylene, acetylene, butane and H₂O emission concentrations will be measured in accordance with EPA RM 320 by extractive FTIR using a MKS 2030.

Each sampling period will consist of extracting a sample of gas at a constant flow rate from a single representative point of the exhaust stack. The sample will pass through a sample probe, through a heated Teflon sample line, through a heated head pump, through a heated Teflon jumper to the enclosed FTIR gas cell and then to the instrument detector. The FTIR gas cell will be maintained at 191°C. Sample measurements will be made approximately once every minute.

The FTIR will provide concentration values using MG 2000 software and R3 recipes. The gas concentrations will be reported in units of either parts per million, wet volume basis (ppmvw – NO_x, NO, NO₂, CO, HCHO, methane, ethane), parts per million, dry volume basis (ppmvd – VOC) or percent, wet volume basis (%vw – H₂O) and logged to a computerized data acquisition system (CDAS). The R3 recipe quantifies VOC emissions based on propane, ethylene, propylene, acetylene and butane levels. NO_x, CO and VOC emission concentrations will be combined with concurrently collected gas flow data to determine emission rates in units of lb/hr, tpy and g/bhp-hr. HCHO emissions will be reported in units of parts per billion dry volume basis, corrected to 15% O₂ (ppbvd @ 15% O₂). VOC measurements will not be used for compliance purposes, but for comparison with RM 25A measurements only.

Once per system set-up and prior to testing; (i) a screen shot of the peak analysis screen with laser frequency and FWHH values included, and (ii) a recovery check will be performed by spiking known concentrations of acetaldehyde (or other surrogate) with sulfur hexafluoride into the flue gas of the stacks via the calibration line of the heated sample line. The spiking levels and spike recoveries will demonstrate adequate system performance. For an additional daily quality check, the sample system will be challenged with NO and CO calibration gases for a system bias check. NO and CO concentrations will be approximately 100 ppm. All calibration gases will be prepared and certified in accordance with EPA Protocol 1. During one run the spectral residual and concentration validation check will be conducted for NO, NO₂, CO, H₂O, CO₂, ethylene and HCHO using the analysis validation utility (AVU) software from MKS.

A cylinder of nitrogen will be used for purging the instrument's optics. Nitrogen will be passed through the cell to obtain a back ground spectrum and at least eight blank spectra for error analysis and determining minimum detection limits in accordance with the ASTM D6348-03 pre-test MDC2 formula. A screen shot of the signal to noise ratio will be included in the report.

Before and after every run the path length of infrared light through the cell will be measured using a Calibration Transfer Standard (CTS) gas. The CTS gas will be approximately 100 ppm ethylene blended in nitrogen. The CTS pre and post run mean differences will meet the method's requirements (< 5% difference between CTS gas pre and post run measurements).

7. Quality Control / Quality Assurance

AST follows the procedures outlined in the Quality Assurance/Quality Control (QA/QC) Management Plan to ensure the continuous production of useful and valid data throughout the course of this test program. The QC checks and procedures described in this section represent an integral part of the overall sampling and analytical scheme. Adherence to prescribed procedures is quite often the most applicable QC check.

Field test equipment is assigned a unique, permanent identification number. Prior to mobilizing for the test program, equipment is inspected before being packed to detect equipment problems prior to arriving on site. This minimizes

lost time on the job site due to equipment failure. Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. Therefore, replacements for critical equipment or components are brought to the job site. Equipment returning from the field is inspected before it is returned to storage. During these inspections, items are cleaned, repaired, reconditioned and recalibrated where necessary.

8. Equations

See *Appendix 3 – Equations*

9. Data Sheets

See *Appendix 4 – Data Sheets*

10. Safety Requirements

Testing personnel will undergo site-specific safety training for all applicable areas upon arrival at the site. AST personnel will have current OSHA or MSHA safety training and be equipped with hard hats, safety glasses with side shields, steel-toed safety shoes, hearing protection, fire resistant clothing, and fall protection (including shock-corded lanyards and full-body harnesses). AST personnel will comport themselves in a manner consistent with Client and AST's safety policies.

A Job Safety Analysis (JSA) will be completed daily by the AST Field Team Leader.

11. Test Schedule

Testing is proposed for the week of April 8, 2019. The testing will require one (1), approximate, 10-hour test day to complete. Testing personnel will arrive on-site the day before testing to set up the necessary sampling apparatus. Table 4 presents an outline and tentative schedule for the emissions testing program.

Table 4
Program Outline and Tentative Test Schedule

Testing Location	Parameter	U.S. EPA Method	Runs	Run Duration	Est. Onsite Time
DAY 1 – April 8, 2019					
Equipment Setup & Pretest QA/QC Checks					4-hours
DAY 2 – April 9, 2019					
(1) Caterpillar 3606 4SLB RICE C-210 AIRS 007	VFR	1, 2	3	60-minutes	10-hours
	O ₂ , CO ₂	3A			
	VOC	25A			
	H ₂ O, NO _x , NO, NO ₂ , CO, VOC, HCHO, methane, ethane	320			
(1) Caterpillar 3606 4SLB RICE C-211 AIRS 008	VFR	1, 2	3	60-minutes	
	O ₂ , CO ₂	3A			
	VOC	25A			
	H ₂ O, NO _x , NO, NO ₂ , CO, VOC, HCHO, methane, ethane	320			

12. Test Report

The final test report must be submitted to CDPHE within 30-days of the completion of the testing and will include the following information.

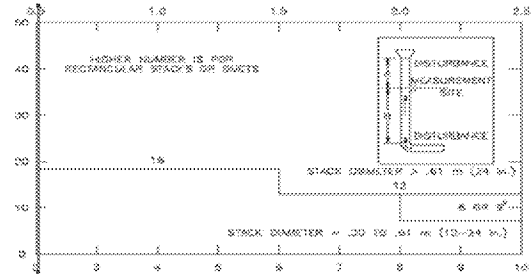
- *Introduction* – Brief discussion of project scope of work and activities.
- *Results and Discussion* – A summary of test results and process/control system operational data with comparison to regulatory requirements or vendor guarantees along with a description of process conditions and/or testing deviations that may have affected the testing results.
- *Methodology* – A description of the sampling and analytical methodologies.
- *Sample Calculations* – Example calculations for each target parameter.
- *Field Data* – Copies of actual handwritten or electronic field data sheets.
- *Quality Control Data* – Copies of all instrument calibration data and/or calibration gas certificates.
- *Process Operating/Control System Data* – Process operating, control system data (as provided by Powhatan CS) to support the test results.

Appendix A

Location --
Source --
Project No. --
Date: --

Stack Parameters

Duct Orientation: Vertical
Duct Design: Circular
Distance from Far Wall to Outside of Port: -- in
Nipple Length: -- in
Depth of Duct: 15.75 in
Width of Duct: -- in
Cross Sectional Area of Duct: 1.35 ft²
Equivalent Diameter: -- in
No. of Test Ports: 2
Distance A: -- ft
Distance A Duct Diameters: 0.5 (must be > 0.5)
Distance B: -- ft
Distance B Duct Diameters: 2.0 (must be > 2)
Minimum Number of Traverse Points: 16
Actual Number of Traverse Points: 16



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

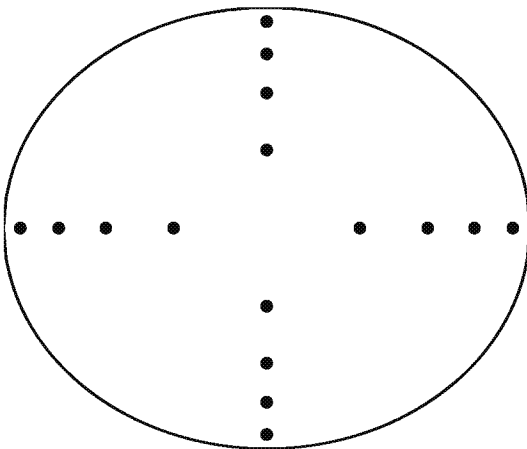
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

*Percent of stack diameter from inside wall to traverse point.

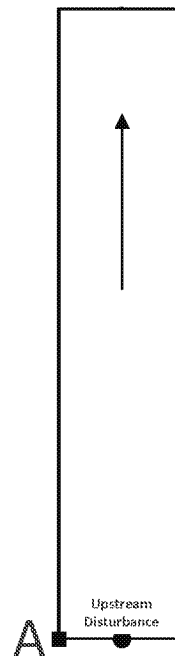
Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	0.50	--
2	10.5	1.65	--
3	19.4	3.06	--
4	32.3	5.09	--
5	67.7	10.66	--
6	80.6	12.69	--
7	89.5	14.10	--
8	96.8	15.25	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = -- ft.
B = -- ft.
Depth of Duct = 15.75 in.

Cross Sectional Area



Downstream Disturbance



Appendix B

Facility Name	Powhaton CS	Powhaton CS
Equip ID	C-210	C-211
Description	Cat 3606 A4	Cat 3606 A4
Site Rated HP	1875	1875
AIRS ID	001/2176/007	001/2176/008
Initial Start up Date	43444	43445
Manufacture Date	43101	42979
Serial Number	JFE00914	JFE00818
Contract Equip ID	138	127
Permit Number	17AD0780	17AD0780
Portable Test Period	Semi-Annual	Semi-Annual
1st Quarter 2019 Testing	Initial Reference	Initial Reference
Nox (tpy)	9.1	9.1
NOx (lb/hr)	2.1	2.1
CO (tpy)	2.7	2.7
CO (lb/hr)	0.62	0.62
VOC(tpy)	5.4	5.4

CONSTRUCTION PERMIT

Permit number: **17AD0780** Issuance: **1**
 Date issued: **January 10, 2018**
 Issued to: **Discovery DJ Services LLC**
 Facility Name: **Discovery Powhatan Compressor Station**
 Plant AIRS ID: **001/2176**
 Physical Location: **SEC 17 T1S R65W**
 County: **Adams County**
 General Description: **Natural Gas Compressor Station**

Equipment or activity subject to this permit:

Facility Equipment ID	AIRS Point	Equipment Description	Emissions Control Description
CB	001	Compressor maintenance blowdowns.	None
D-3101	003	One (1) Triethylene glycol (TEG) natural gas dehydration unit (make, model, serial number: TBD) with a design capacity of 20 MMscf per day. This emissions unit is equipped with two (2) glycol pumps (make, model: TBD) with a total design capacity of 4.2 gallons per minute. This unit is equipped with a flash tank and still vent.	Enclosed Flare
D-3111	004	One (1) Triethylene glycol (TEG) natural gas dehydration unit (make, model, serial number: TBD) with a design capacity of 20 MMscf per day. This emissions unit is equipped with two (2) glycol pumps (make, model: TBD) with a total design capacity of 4.2 gallons per minute. This unit is equipped with a flash tank and still vent.	Enclosed Flare
F-4101	006	Process flare controlling emissions from TEG dehydrators (Points 003 & 004).	None
C-210	007	One (1) Caterpillar 3606 A4, serial number TBD, natural gas-fired, turbo-charged, 4SLB reciprocating internal combustion engine, site rated at 1875 horsepower. This emission unit is used for natural gas compression.	Oxidation catalyst and air/fuel ratio control

C-211	008	One (1) Caterpillar 3606 A4, serial number TBD, natural gas-fired, turbo-charged, 4SLB reciprocating internal combustion engine, site rated at 1875 horsepower. This emission unit is used for natural gas compression.	Oxidation catalyst and air/fuel ratio control
C-212	009	One (1) Caterpillar 3606 A4, serial number TBD, natural gas-fired, turbo-charged, 4SLB reciprocating internal combustion engine, site rated at 1875 horsepower. This emission unit is used for natural gas compression.	Oxidation catalyst and air/fuel ratio control
C-213	010	One (1) Caterpillar G3516 J, serial number TBD, natural gas-fired, turbo-charged, 4SLB reciprocating internal combustion engine, site rated at 1380 horsepower. This emission unit is used for natural gas compression.	Oxidation catalyst and air/fuel ratio control

Points 007, 008, 009: These engines may be replaced with another engine in accordance with the temporary engine replacement provision or another Caterpillar 3603 A4 engine in accordance with the permanent replacement provision of the Alternate Operating Scenario (AOS), included in this permit as Attachment A.

Point 010: This engine may be replaced with another engine in accordance with the temporary engine replacement provision or another Caterpillar G3516 J engine in accordance with the permanent replacement provision of the Alternate Operating Scenario (AOS), included in this permit as Attachment A.

This permit is granted subject to all rules and regulations of the Colorado Air Quality Control Commission and the Colorado Air Pollution Prevention and Control Act (C.R.S. 25-7-101 et seq), to this specific general terms and conditions included in this document and the following specific terms and conditions.

REQUIREMENTS TO SELF-CERTIFY FOR FINAL AUTHORIZATION

1. YOU MUST notify the Air Pollution Control Division (the Division) no later than fifteen days of the latter of commencement of operation or issuance of this permit, by submitting a Notice of Startup form to the Division for the equipment covered by this permit. The Notice of Startup form may be downloaded online at www.colorado.gov/pacific/cdphe/other-air-permitting-notice. Failure to notify the Division of startup of the permitted source is a violation of Air Quality Control Commission (AQCC) Regulation Number 3, Part B, Section III.G.1. and can result in the revocation of the permit.
2. Within one hundred and eighty days (180) of the latter of commencement of operation or issuance of this permit, compliance with the conditions contained in this permit shall be demonstrated to the Division. It is the owner or operator's responsibility to self-certify compliance with the conditions. Failure to demonstrate compliance within 180 days may result in revocation of the permit. A self certification form and guidance on how to self-certify compliance as required by this permit may be obtained online at www.colorado.gov/pacific/cdphe/air-permit-self-certification. (Regulation Number 3, Part B, Section III.G.2.)
3. This permit shall expire if the owner or operator of the source for which this permit was issued: (i) does not commence construction/modification or operation of this source within 18 months after either, the date of issuance of this construction permit or the date on which such construction or activity was scheduled to commence as set forth in the permit application associated with this permit; (ii) discontinues construction for a period of eighteen months or more; (iii) does not complete construction within a reasonable time of the estimated completion date. The Division may grant extensions of the deadline. (Regulation Number 3, Part B, Section III.F.4.)
4. The operator shall complete all initial compliance testing and sampling as required in this permit and submit the results to the Division as part of the self-certification process. (Regulation Number 3, Part B, Section III.E.)

5. **Points 003 & 004:** The following information shall be provided to the Division within fifteen (15) days of the latter of commencement of operation or issuance of this permit.

- The dehydrator manufacturer name, model number and serial number
- The glycol circulation pump manufacturer name and model number

This information shall be included with the Notice of Startup submitted for the equipment. (Reference: Regulation Number 3, Part B, III.E.)

6. **Points 007-010:** The following information shall be provided to the Division within fifteen (15) days of the latter of commencement of operation or issuance of this permit.

- manufacture date
- construction date
- order date
- date of relocation into Colorado
- manufacturer
- model number
- serial number

This information shall be included with the Notice of Startup submitted for the equipment. (Reference: Regulation No. 3, Part B, III.E.)

7. The operator shall retain the permit final authorization letter issued by the Division, after completion of self-certification, with the most current construction permit. This construction permit alone does not provide final authority for the operation of this source.

EMISSION LIMITATIONS AND RECORDS

8. Emissions of air pollutants shall not exceed the following limitations. (Regulation Number 3, Part B, Section II.A.4.)

9. **Monthly Limits:**

Facility Equipment ID	AIRS Point	Tons per Month				Emission Type
		PM2.5	NO _x	VOC	CO	
D-3101	003	--	--	0.5	--	Point
D-3111	004	--	--	0.5	--	Point
C-210	007	--	0.8	0.5	0.3	Point
C-211	008	--	0.8	0.5	0.3	Point
C-212	009	--	0.8	0.5	0.3	Point
C-213	010	-	0.6	0.4	0.3	Point

Note: Monthly limits are based on a 31-day month.

The owner or operator shall calculate monthly emissions based on the calendar month.

Facility-wide emissions of each individual hazardous air pollutant shall not exceed 1,359 pounds per month.

Facility-wide emissions of total hazardous air pollutants shall not exceed 3,398 pounds per month.

The facility-wide emissions limitation for hazardous air pollutants shall apply to all permitted emission units at this facility.

Annual Limits:

Facility Equipment ID	AIRS Point	Tons per Year				Emission Type
		PM2.5	NO _x	VOC	CO	
CB	001	--	--	4.4	--	Point
D-3101	003	--	--	5.7	--	Point
D-3111	004	--	--	5.7	--	Point
F-4101	006	--	5.4	--	10.7	Point
C-210	007	--	9.1	5.4	2.7	Point
C-211	008	--	9.1	5.4	2.7	Point
C-212	009	--	9.1	5.4	2.7	Point
C-213	010	-	6.7	4.8	2.7	Point

Note: See "Notes to Permit Holder" for information on emission factors and methods used to calculate limits.

Facility-wide emissions of each individual hazardous air pollutant shall not exceed 8.0 tons per year.

Facility-wide emissions of total hazardous air pollutants shall not exceed 20.0 tons per year.

The facility-wide emissions limitation for hazardous air pollutants shall apply to all permitted emission units at this facility.

Points 003, 004, 007-010: During the first twelve (12) months of operation, compliance with both the monthly and annual emission limitations is required. After the first twelve (12) months of operation, compliance with only the annual limitation is required.

Compliance with the annual limits, for both criteria and hazardous air pollutants, shall be determined on a rolling twelve (12) month total. By the end of each month, a new twelve month total is calculated based on the previous twelve months' data. The permit holder shall calculate actual emissions each month and keep a compliance record on site or at a local field office with site responsibility for Division review.

10. **Points 003 & 004:** Compliance with the emission limits in this permit shall be demonstrated by running the GRI GlyCalc model version 4.0 or higher on a monthly basis using the most recent extended wet gas analysis and recorded operational values, including: gas throughput, lean glycol recirculation rate, condenser temperature, flash tank temperature and pressure, wet gas inlet temperature, and wet gas inlet pressure. Recorded operational values, except for gas throughput, shall be averaged on a monthly basis for input into the model and be provided to the Division upon request.
11. The emission points in the table below shall be operated and maintained with the emissions control equipment as listed in order to reduce emissions to less than or equal to the limits established in this permit. (Regulation Number 3, Part B, Section III.E.)

Facility Equipment ID	AIRS Point	Control Device	Pollutants Controlled
D-3101	003	Still Vent: Enclosed Flare	VOC and HAPs
		Flash Tank: Enclosed Flare	VOC and HAPs
D-3111	004	Still Vent: Enclosed Flare	VOC and HAPs
		Flash Tank: Enclosed Flare	VOC and HAPs
C-210	007	Oxidation catalyst and air/fuel ratio controller	NOx, VOC, CO, Formaldehyde
C-211	008	Oxidation catalyst and air/fuel ratio controller	NOx, VOC, CO, Formaldehyde
C-212	009	Oxidation catalyst and air/fuel ratio controller	NOx, VOC, CO, Formaldehyde
C-213	010	Oxidation catalyst and air/fuel ratio controller	NOx, VOC, CO, Formaldehyde

PROCESS LIMITATIONS AND RECORDS

12. This source shall be limited to the following maximum processing rates as listed below. Monthly records of the actual processing rates shall be maintained by the owner or operator and made available to the Division for inspection upon request. (Regulation Number 3, Part B, II.A.4.)

Process Limits

Facility Equipment ID	AIRS Point	Process Parameter	Annual Limit	Monthly Limit (31 days)
CB	001	Natural gas vented	0.40 MMscf	N/A
D-3101	003	Natural gas throughput	7300 MMscf	620 MMscf
D-3111	004	Natural gas throughput	7300 MMscf	620 MMscf
F-4101	006	Natural gas combusted	51.5 MMscf	4.38 MMscf
C-210	007	Consumption of natural gas as a fuel	109.0 MMscf	9.26 MMscf
C-211	008	Consumption of natural gas as a fuel	109.0 MMscf	9.26 MMscf
C-212	009	Consumption of natural gas as a fuel	109.0 MMscf	9.26 MMscf
C-213	010	Consumption of natural gas as a fuel	80.2 MMscf	6.82 MMscf

Points 003 & 004: The owner or operator shall monitor monthly process rates based on the calendar month. The volume of gas processed shall be measured by gas meter or by assuming the maximum design rate of the dehydrator unit of 20.0 MMscf/d.

During the first twelve (12) months of operation, compliance with both the monthly and annual throughput limitations is required. After the first twelve (12) months of operation, compliance with only the annual limitation is required.

Compliance with the annual throughput limits shall be determined on a rolling twelve (12) month total. By the end of each month, a new twelve-month total is calculated based on the previous twelve months' data. The permit holder shall calculate throughput each month and keep a compliance record on site or at a local field office with site responsibility, for Division review.

13. **Points 003 & 004:** This unit shall be limited to the maximum lean glycol circulation rate of 4.2 gallons per minute. The lean glycol recirculation rate shall be recorded **weekly** in a log maintained on site and made available to the Division for inspection upon request. Glycol recirculation rate shall be monitored by one of the following methods: assuming maximum design pump rate, using glycol flow meter(s), or recording strokes per minute and converting to circulation rate. This maximum glycol circulation rate does not preclude compliance with the optimal glycol circulation rate (L_{opt}) provisions under MACT HH. (Reference: Regulation Number 3, Part B, II.A.4)
14. **Points 003 & 004:** On a monthly basis, the owner or operator shall monitor and record operational values including: flash tank temperature and pressure, and wet gas inlet temperature and pressure. These records shall be maintained for a period of five years.
15. **Points 007-010:** Fuel consumption shall be measured by one of the following methods: individual engine fuel meter; facility-wide fuel meter attributed to fuel consumption rating and hours of operation; or manufacturer-provided fuel consumption rate.

STATE AND FEDERAL REGULATORY REQUIREMENTS

16. **Points 003, 004, 006-010:** The permit number and ten digit AIRS ID number assigned by the Division (e.g. 123/4567/001) shall be marked on the subject equipment for ease of identification. (Regulation Number 3, Part B, Section III.E.) (State only enforceable)
17. This source is subject to the odor requirements of Regulation Number 2. (State only enforceable)
18. **Point 001:** The owner or operator shall record the following information during each compressor blowdown. Records shall be maintained by the applicant and made available to the Division for inspection upon request. (Reference: Regulation No. 3 Part B, II.A.4)
 - Date and time of blowdown.
 - Estimated volume of each blowdown.

In order to demonstrate compliance with the emission limitations of this permit, emissions due to blowdown activities shall be calculated on a monthly basis. The emissions calculations shall be based on the information collected above and the emission factors listed in the Notes section of this permit. VOC and HAP emissions collected from each event shall be summed to obtain monthly emissions from vented blowdown activities. Monthly emissions shall be used in a rolling twelve-month total to monitor compliance with the annual limitations. Each month a new twelve-month total shall be calculated using the previous twelve months' data.

19. **Points 003 & 004:** This source is subject to Regulation Number 7, Section XII.H. The operator shall comply with all applicable requirements of Section XII and, specifically, shall:
 - Comply with the recordkeeping, monitoring, reporting and emission control requirements for glycol natural gas dehydrators; and
 - Ensure uncontrolled actual emissions of volatile organic compounds from the still vent and vent from any gas-condensate-glycol (GCG) separator (flash separator or flash tank), if present, shall be reduced by at least 90 percent on a rolling twelve-month basis through the use of a condenser or air pollution control equipment. (Regulation Number 7, Section XII.H.1.)
20. **Points 003 & 004:** The glycol dehydration unit covered by this permit is subject to the emission control requirements in Regulation Number 7, Section XVII.D.3. Beginning May 1, 2015, still vents and vents from any flash separator or flash tank on a glycol natural gas dehydrator located at an

oil and gas exploration and production operation, natural gas compressor station, or gas-processing plant subject to control requirements pursuant to Section XVII.D.4., shall reduce uncontrolled actual emissions of hydrocarbons by at least 95% on a rolling twelve-month basis through the use of a condenser or air pollution control equipment.

21. **Points 003 & 004:** The glycol dehydration unit at this facility is subject to National Emissions Standards for Hazardous Air Pollutants for Source Categories from Oil and Natural Gas Production Facilities, Subpart HH. This facility shall be subject to applicable area source provisions of this regulation, as stated in 40 C.F.R Part 63, Subpart A and HH. (Regulation Number 8, Part E, Subpart A and HH)

MACT HH Applicable Requirements	Area Source
	Benzene emissions exemption
§63.764 - General Standards	<p>§63.764 (e)(1) - The owner or operator is exempt from the requirements of paragraph (d) of this section if the criteria listed in paragraph (e)(1)(i) or (ii) of this section are met, except that the records of the determination of these criteria must be maintained as required in §63.774(d)(1).</p> <p>§63.764 (e)(1)(ii) - The actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram per year, as determined by the procedures specified in §63.772(b)(2) of this subpart.</p>
§63.772 - Test Methods, Compliance Procedures and Compliance Demonstration	<p>§63.772(b) - Determination of glycol dehydration unit flowrate or benzene emissions. The procedures of this paragraph shall be used by an owner or operator to determine glycol dehydration unit natural gas flowrate or benzene emissions to meet the criteria for an exemption from control requirements under §63.764(e)(1).</p> <p>§63.772(b)(2) - The determination of actual average benzene emissions from a glycol dehydration unit shall be made using the procedures of either paragraph (b)(2)(i) or (b)(2)(ii) of this section. Emissions shall be determined either uncontrolled, or with federally enforceable controls in place.</p> <p>§63.772(b)(2)(i) - The owner or operator shall determine actual average benzene emissions using the model GRI-GLYCalc™, Version 3.0 or higher, and the procedures presented in the associated GRI-GLYCalc™ Technical Reference Manual. Inputs to the model shall be representative of actual operating conditions of the glycol dehydration unit and may be determined using the procedures documented in the Gas Research Institute (GRI) report entitled "Atmospheric Rich/Lean Method for Determining Glycol Dehydrator Emissions" (GRI-95/0368.1); or</p> <p>§63.772(b)(2)(ii) - The owner or operator shall determine an average mass rate of benzene emissions in kilograms per hour through direct measurement using the methods in §63.772(a)(1)(i) or (ii), or an alternative method according to §63.7(f). Annual emissions in kilograms per year shall be determined by multiplying the mass rate by the number of hours the unit is operated per year. This result shall be converted to megagrams per year.</p>
§63.774 - Recordkeeping Requirements	<p>§63.774 (d)(1) - An owner or operator of a glycol dehydration unit that meets the exemption criteria in §63.764(e)(1)(i) or §63.764(e)(1)(ii) shall maintain the records specified in paragraph (d)(1)(i) or paragraph (d)(1)(ii) of this section, as appropriate, for that glycol dehydration unit.</p> <p>§63.774 (d)(1)(ii) - The actual average benzene emissions (in terms of benzene emissions per year) as determined in accordance with §63.772(b)(2).</p>

22. **Point 006:** The combustion device covered by this permit is subject to Regulation Number 7, Section XVII.B.2. General Provisions (State only enforceable). If a flare or other combustion device is used to control emissions of volatile organic compounds to comply with Section XVII, it shall be enclosed; have no visible emissions during normal operations, as defined under Regulation Number 7, XVII.A.16; and be designed so that an observer can, by means of visual observation from the outside of the enclosed flare or combustion device, or by other convenient means approved by the Division, determine whether it is operating properly. This flare must be equipped with an operational auto-igniter according to the following schedule:
- All combustion devices installed on or after May 1, 2014, must be equipped with an operational auto-igniter upon installation of the combustion device;
 - All combustion devices installed before May 1, 2014, must be equipped with an operational auto-igniter by or before May 1, 2016, or after the next combustion device planned shutdown, whichever comes first.
23. **Points 007-010:** This equipment is subject to the control requirements for stationary and portable engines in the 8-hour ozone control area under Regulation No. 7, Section XVI.B.2. For lean burn reciprocating internal combustion engines, an oxidation catalyst shall be required.
24. **Points 007-010:** Visible emissions shall not exceed twenty percent (20%) opacity during normal operation of the source. During periods of startup, process modification, or adjustment of control equipment visible emissions shall not exceed 30% opacity for more than six minutes in any sixty consecutive minutes. Emission control devices subject to Regulation 7, Sections XII.C.1.d or XVII.B.2.b shall have no visible emissions. (Reference: Regulation No. 1, Section II.A.1. & 4.)
25. **Points 007-010:** This equipment is subject to the control requirements for natural gas-fired reciprocating internal combustion engines under Regulation No. 7, Section XVII.E (State only enforceable). The owner or operator of any natural gas-fired reciprocating internal combustion engine that is either constructed or relocated to the state of Colorado from another state after the date listed in the table below shall operate and maintain each engine according to the manufacturer's written instructions or procedures to the extent practicable and consistent with technological limitations and good engineering and maintenance practices over the entire life of the engine so that it achieves the emission standards required in the table below:

Maximum ¹ Engine HP	Construction or Relocation Date	Emission Standard in g/hp-hr		
		NOx	CO	VOC
<100HP	Any	N/A	N/A	N/A
≥100HP and <500HP	January 1, 2008 January 1, 2011	2.0 1.0	4.0 2.0	1.0 0.7
≥500HP	July 1, 2007 July 1, 2010	2.0 1.0	4.0 2.0	1.0 0.7

¹ Maximum engine horsepower is the nameplate rating of the engine and does not account for deration.

26. **Points 007-010:** This source is subject to the requirements of:
- *Regulation No. 8, Part E, Subpart III.FFFF: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) of 40 C.F.R. Part 63, Subpart ZZZZ, and*
 - *Regulation No. 8, Part E, Subpart I.A, National Emission Standards for Hazardous Air Pollutants for Source Categories: General Provisions, 40 CFR Part 63*

including, but not limited to, the following:

- **Emission and Operating Limitations**

- **63.6600(b)** - If you own or operate a new or reconstructed 4SLB stationary RICE with a site rating of more than 500 brake HP located at major source of HAP emissions you must comply with the following emission limitations (Table 2a, Subpart ZZZZ to Part 63):
 - reduce CO emissions by 93 percent or more; or
 - limit concentration of formaldehyde in the stationary RICE exhaust to 14 ppmvd or less at 15 percent O₂.
- **63.6600(b)** - If you own or operate a new or reconstructed 4SLB stationary RICE with a site rating of more than 500 brake HP located at major source of HAP emissions you must comply with the following operating limitations (Table 2b, Subpart ZZZZ to Part 63):
 - maintain your catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water at 100 percent load plus or minus 10 percent from the pressure drop across the catalyst that was measured during the initial performance test; and
 - maintain the temperature of your stationary RICE exhaust so that the catalyst inlet temperature is greater than or equal to 450 °F and less than or equal to 1350 °F.

- **General Compliance Requirements**

- **§63.6605(a)** - You must be in compliance with the emission limitations and operating limitations in this subpart that apply to you at all times, except during periods of startup, shutdown, and malfunction.
- **§63.6605(b)** - If you must comply with emission limitations and operating limitations, you must operate and maintain your stationary RICE, including air pollution control and monitoring equipment, in a manner consistent with good air pollution control practices for minimizing emissions at all times, including during startup, shutdown, and malfunction.

- **Testing and Initial Compliance Requirements**

- **§63.6610(a)** - You must conduct the initial performance test or other initial compliance demonstrations in Table 4 to Subpart ZZZZ of Part 63 that apply to you within 180 days after the compliance date that is specified for your stationary RICE in §63.6595 and according to the provisions in §63.7(a)(2).
- **§63.6615** - If you must comply with the emission limitations and operating limitations, you must conduct subsequent performance tests semiannually (as per Table 3 of Subpart ZZZZ to Part 63). After you have demonstrated compliance for two consecutive tests, you may reduce the frequency of subsequent performance tests to annually. If the results of any subsequent annual performance test indicate the stationary RICE is not in compliance with the CO or formaldehyde emission limitation, or you deviate from any of your operating limitations, you must resume semiannual performance tests.
- **§63.6625(a)** - If you elect to install a CEMS as specified in Table 5 of this subpart, you must install, operate, and maintain a CEMS to monitor CO and either oxygen or CO₂ at both the inlet and the outlet of the control device according to the requirements in paragraphs 63.6625(a)(1) through 63.6625(4) of Subpart ZZZZ to Part 63.

- **§63.6625(b)** - If you are required to install a continuous parameter monitoring system (CPMS) as specified in Table 5 of this subpart, you must install, operate, and maintain each CPMS according to the requirements in §63.8.
- **§63.6630(a)** - You must demonstrate initial compliance with each emission and operating limitation that applies to you according to Table 5 of Subpart ZZZZ to Part 63.
- **§63.6630(b)** - During the initial performance test, you must establish each operating limitation in Tables 1b and 2b of Subpart ZZZZ to Part 63 that applies to you.
- **§63.6630(c)** - You must submit the Notification of Compliance Status containing the results of the initial compliance demonstration according to the requirements in §63.6645.
- **Continuous Compliance Requirements**
 - **§63.6635(b)** - Except for monitor malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), you must monitor continuously at all times that the stationary RICE is operating.
 - **§63.6635(c)** - You may not use data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities in data averages and calculations used to report emission or operating levels. You must, however, use all the valid data collected during all other periods.
 - **§63.6640(a)** - You must demonstrate continuous compliance with each emission limitation and operating limitation in Tables 1a and 1b and Tables 2a and 2b of subpart ZZZZ of Part 63 that apply to you according to methods specified in Table 6 of Subpart ZZZZ of Part 63.
 - **§63.6640(b)** - You must report each instance in which you did not meet each emission limitation or operating limitation in Tables 1a and 1b and Tables 2a and 2b of Subpart ZZZZ of Part 63 that apply to you. These instances are deviations from the emission and operating limitations in this subpart. These deviations must be reported according to the requirements in §63.6650. If you change your catalyst, you must reestablish the values of the operating parameters measured during the initial performance test. When you reestablish the values of your operating parameters, you must also conduct a performance test to demonstrate that you are meeting the required emission limitation applicable to your stationary RICE.
 - **§63.6640(d)** - Consistent with §§63.6(e) and 63.7(e)(1), deviations from the emission or operating limitations that occur during a period of startup, shutdown, or malfunction are not violations if you demonstrate to the Administrator's satisfaction that you were operating in accordance with §63.6(e)(1). For new, reconstructed, and rebuilt stationary RICE, deviations from the emission or operating limitations that occur during the first 200 hours of operation from engine startup (engine burn-in period) are not violations.
 - **§63.6640(e)** - You must also report each instance in which you did not meet the requirements in Table 8 of Subpart ZZZZ to Part 63 that apply to you.
- **Notifications, Reports and Records**
 - **§63.6645(a)** - If you own or operate a stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions you must submit all of the notifications in §§63.7(b) and (c), 63.8(e), (f)(4) and (f)(6), 63.9(b) through (e), and (g) and (h) that apply to you by the dates specified.

- **§63.6645(g)** - If you are required to conduct a performance test, you must submit a Notification of Intent to conduct a performance test at least 60 days before the performance test is scheduled to begin as required in §63.7(b)(1).
- **§63.6645(h)** - If you are required to conduct a performance test or other initial compliance demonstration as specified in Tables 4 and 5 of Subpart ZZZZ to Part 63, you must submit a Notification of Compliance Status according to §63.9(h)(2)(ii).
 - **§63.6645(h)(1)** - For each initial compliance demonstration required in Table 5 of Subpart ZZZZ to Part 63 that does not include a performance test, you must submit the Notification of Compliance Status before the close of business on the 30th day following the completion of the initial compliance demonstration.
 - **§63.6645(h)(2)** - For each initial compliance demonstration required in Table 5 of Subpart ZZZZ to Part 63 that includes a performance test conducted according to the requirements in Table 3 to this subpart, you must submit the Notification of Compliance Status, including the performance test results, before the close of business on the 60th day following the completion of the performance test according to §63.10(d)(2).
- **§63.6650(a)** - You must submit each report in Table 7 of Subpart ZZZZ to Part 63 that applies to you.
- **§63.6655(a)** - If you must comply with the emission and operating limitations, you must keep the records described in §63.6655(a)(1) through (a)(3), §63.6655 (b)(1) through (b)(3) and §63.6655 (c).
- **§63.6655(d)** - You must keep the records required in Table 6 of Subpart ZZZZ of Part 63 to show continuous compliance with each emission or operating limitation that applies to you.
- **§63.6660(a)** - Your records must be in a form suitable and readily available for expeditious review according to §63.10(b)(1).
- **§63.6660(b)** - As specified in §63.10(b)(1), you must keep each record for 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record.
- **§63.6660(c)** - You must keep each record readily accessible in hard copy or electronic form on-site for at least 2 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record, according to §63.10(b)(1). You can keep the records off-site for the remaining 3 years.
- **Other Requirements and Information**
 - **§63.6665** - Table 8 to this subpart shows which parts of the General Provisions in §§63.1 through 63.15 apply to you.

OPERATING & MAINTENANCE REQUIREMENTS

27. **Points 003, 004, 006-010:** Upon startup of these points, the owner or operator shall follow the most recent operating and maintenance (O&M) plan and record keeping format approved by the Division, in order to demonstrate compliance on an ongoing basis with the requirements of this permit. Revisions to the O&M plan are subject to Division approval prior to implementation. (Regulation Number 3, Part B, Section III.G.7.)

COMPLIANCE TESTING AND SAMPLING

Initial Testing Requirements

28. **Points 001, 003 & 004:** The owner or operator shall complete the initial extended wet gas analysis within one hundred and eighty days (180) of the latter of commencement of operation

or issuance of this permit. The owner or operator shall use this analysis to calculate actual emissions, as prescribed in the Emission Limitation and Records section of this permit, to verify initial compliance with the emission limits. The owner or operator shall submit the analysis and the emission calculation results to the Division as part of the self-certification process. (Reference: Regulation Number 3, Part B, Section III.E.)

29. **Points 007-010:** A source initial compliance test shall be conducted on to measure the emission rate(s) for the pollutants listed below in order to demonstrate compliance with the emission limits in this permit. The test protocol must be in accordance with the requirements of the Air Pollution Control Division Compliance Test Manual and shall be submitted to the Division for review and approval at least thirty (30) days prior to testing. No compliance test shall be conducted without prior approval from the Division. Any compliance test conducted to show compliance with a monthly or annual emission limitation shall have the results projected up to the monthly or annual averaging time by multiplying the test results by the allowable number of operating hours for that averaging time (Reference: Regulation No. 3, Part B., Section III.G.3)

Oxides of Nitrogen using EPA approved methods
Carbon Monoxide using EPA approved methods
Formaldehyde

30. **Point 006:** The owner or operator shall demonstrate compliance with opacity standards, using EPA Reference Method 22, 40 C.F.R. Part 60, Appendix A, to determine the presence or absence of visible emissions. "Visible Emissions" means observations of smoke for any period or periods of duration greater than or equal to one minute in any fifteen minute period during normal operation. (Regulation Number 7, Sections XVII.B.2. and XVII.A.16)

Periodic Testing Requirements

31. **Points 003 & 004:** The owner or operator shall complete an extended wet gas analysis prior to the inlet of the dehydration unit on an annual basis. Results of the wet gas analysis shall be used to calculate emissions of criteria pollutants and hazardous air pollutants per this permit and be provided to the Division upon request.
32. **Points 007-010:** This engine is subject to the periodic testing requirements of 40 C.F.R Part 63, Subpart ZZZZ.
33. **Points 007- 010:** This engine is subject to the periodic testing requirements as specified in the operating and maintenance (O&M) plan as approved by the Division. Revisions to your O&M plan are subject to Division approval. Replacements of this unit completed as Alternative Operating Scenarios may be subject to additional testing requirements as specified in Attachment A.

ADDITIONAL REQUIREMENTS

34. A revised Air Pollutant Emission Notice (APEN) shall be filed: (Regulation Number 3, Part A, II.C.)

- Annually by April 30th whenever a significant increase in emissions occurs as follows:

For any criteria pollutant:

For sources emitting **less than 100 tons per year**, a change in actual emissions of five (5) tons per year or more, above the level reported on the last APEN; or

For volatile organic compounds (VOC) and nitrogen oxides sources (NO_x) in ozone nonattainment areas emitting **less than 100 tons of VOC or NO_x per year**, a change in annual actual emissions of one (1) ton per year or more or five percent, whichever is greater, above the level reported on the last APEN; or

For sources emitting **100 tons per year or more**, a change in actual emissions of five percent or 50 tons per year or more, whichever is less, above the level reported on the last APEN submitted; or

For any non-criteria reportable pollutant:

If the emissions increase by 50% or five (5) tons per year, whichever is less, above the level reported on the last APEN submitted to the Division.


- Whenever there is a change in the owner or operator of any facility, process, or activity; or
- Whenever new control equipment is installed, or whenever a different type of control equipment replaces an existing type of control equipment; or
- Whenever a permit limitation must be modified; or
- No later than 30 days before the existing APEN expires.

GENERAL TERMS AND CONDITIONS

35. This permit and any attachments must be retained and made available for inspection upon request. The permit may be reissued to a new owner by the APCD as provided in AQCC Regulation Number 3, Part B, Section II.B. upon a request for transfer of ownership and the submittal of a revised APEN and the required fee.
36. If this permit specifically states that final authorization has been granted, then the remainder of this condition is not applicable. Otherwise, the issuance of this construction permit does not provide "final" authority for this activity or operation of this source. Final authorization of the permit must be secured from the APCD in writing in accordance with the provisions of 25-7-114.5(12)(a) C.R.S. and AQCC Regulation Number 3, Part B, Section III.G. Final authorization cannot be granted until the operation or activity commences and has been verified by the APCD as conforming in all respects with the conditions of the permit. Once self-certification of all points has been reviewed and approved by the Division, it will provide written documentation of such final authorization. **Details for obtaining final authorization to operate are located in the Requirements to Self-Certify for Final Authorization section of this permit.**
37. This permit is issued in reliance upon the accuracy and completeness of information supplied by the owner or operator and is conditioned upon conduct of the activity, or construction, installation and operation of the source, in accordance with this information and with representations made by the owner or operator or owner or operator's agents. It is valid only for the equipment and operations or activity specifically identified on the permit.
38. Unless specifically stated otherwise, the general and specific conditions contained in this permit have been determined by the APCD to be necessary to assure compliance with the provisions of Section 25-7-114.5(7)(a), C.R.S.
39. Each and every condition of this permit is a material part hereof and is not severable. Any challenge to or appeal of a condition hereof shall constitute a rejection of the entire permit and upon such occurrence, this permit shall be deemed denied *ab initio*. This permit may be revoked at any time prior to self-certification and final authorization by the Air Pollution Control Division (APCD) on grounds set forth in the Colorado Air Quality Control Act and regulations of the Air Quality Control Commission (AQCC), including failure to meet any express term or condition of the permit. If the Division denies a permit, conditions imposed upon a permit are contested by the owner or operator, or the Division revokes a permit, the owner or operator of a source may request a hearing before the AQCC for review of the Division's action.
40. Section 25-7-114.7(2)(a), C.R.S. requires that all sources required to file an Air Pollution Emission Notice (APEN) must **pay an annual fee** to cover the costs of inspections and administration. If a source or activity is to be discontinued, the owner must notify the Division in writing requesting a cancellation of the permit. Upon notification, annual fee billing will terminate.
41. Violation of the terms of a permit or of the provisions of the Colorado Air Pollution Prevention and Control Act or the regulations of the AQCC may result in administrative, civil or criminal

enforcement actions under Sections 25-7-115 (enforcement), -121 (injunctions), -122 (civil penalties), -122.1 (criminal penalties), C.R.S.

By:


Betsy Gillard, P.E.
Permit Engineer

Permit History

Issuance	Date	Description
Issuance 1	This Issuance	Issued to Discovery DJ Services LLC.

Notes to Permit Holder at the time of this permit issuance:

- 1) The permit holder is required to pay fees for the processing time for this permit. An invoice for these fees will be issued after the permit is issued. The permit holder shall pay the invoice within 30 days of receipt of the invoice. Failure to pay the invoice will result in revocation of this permit. (Regulation Number 3, Part A, Section VI.B.)
- 2) The production or raw material processing limits and emission limits contained in this permit are based on the consumption rates requested in the permit application. These limits may be revised upon request of the owner or operator providing there is no exceedance of any specific emission control regulation or any ambient air quality standard. A revised air pollution emission notice (APEN) and complete application form must be submitted with a request for a permit revision.
- 3) This source is subject to the Common Provisions Regulation Part II, Subpart E, Affirmative Defense Provision for Excess Emissions During Malfunctions. The owner or operator shall notify the Division of any malfunction condition which causes a violation of any emission limit or limits stated in this permit as soon as possible, but no later than noon of the next working day, followed by written notice to the Division addressing all of the criteria set forth in Part II.E.1 of the Common Provisions Regulation. See: <https://www.colorado.gov/pacific/cdphe/aqcc-regs>
- 4) The following emissions of non-criteria reportable air pollutants are estimated based upon the process limits as indicated in this permit. This information is listed to inform the operator of the Division's analysis of the specific compounds emitted if the source(s) operate at the permitted limitations.

Facility Equipment ID	AIRS Point	Pollutant	CAS #	Uncontrolled Emissions (lb/yr)	Controlled Emissions (lb/yr)
CB	001	n-Hexane	110543	336	N/A
D-3101	003	Benzene	71432	21,811	1091
		Toluene	108883	24,428	1221
		Ethylbenzene	100414	6023	301
		Xylenes	1330207	11,653	583
		n-Hexane	110543	4096	205
D-3111	004	Benzene	71432	21,811	1091
		Toluene	108883	24,428	1221
		Ethylbenzene	100414	6023	301
		Xylenes	1330207	11,653	583
		n-Hexane	110543	4096	205
C-210	007	Formaldehyde	50000	7242	724
		Acetaldehyde	75070	1030	N/A
		Acrolein	107028	633	N/A
		Methanol	67561	308	N/A
C-211	008	Formaldehyde	50000	7242	724
		Acetaldehyde	75070	1030	N/A
		Acrolein	107028	633	N/A

		Methanol	67561	308	N/A
C-212	009	Formaldehyde	50000	7242	724
		Acetaldehyde	75070	1030	N/A
		Acrolein	107028	633	N/A
		Methanol	67561	308	N/A
C-213	010	Formaldehyde	50000	11,460	933
		Acetaldehyde	75070	834	N/A
		Acrolein	107028	513	N/A

Note: All non-criteria reportable pollutants in the table above with uncontrolled emission rates above 250 pounds per year (lb/yr) are reportable and may result in annual emission fees based on the most recent Air Pollution Emission Notice.

- 5) The emission levels contained in this permit are based on the following emission factors:

Point 001:

CAS #	Pollutant	Weight Fraction of Gas (%)	Uncontrolled Emission Factors (lb/event)	Source
	VOC	33.57	90.41	Mass balance
110543	n-Hexane	1.30	3.50	

Points 003 & 004:

The emission levels contained in this permit are based on information provided in the application and the GRI GlyCalc 4.0 model. Controlled emissions are based on a flare control efficiency of 95%.

Total actual flash tank and still vent combustion emissions are based on the sum of the emissions for the still vent primary control and flash tank primary control. Total combustion emissions for Points 003 & 004 are reflected in the emission calculations for Point 006: Process Flare.

Point 006:

Pollutant	Uncontrolled Emission Factors (lb/MMSCF)	Source
NOx	206.59	TCEQ
CO	413.17	TCEQ

Note: The emissions factors for this point are based on a weighted fuel heating value of 1497 Btu/scf.

Points 007, 008, & 009:

CAS	Pollutant	Units	Emission Factors - Uncontrolled	Emission Factors - Controlled	Emission Factor Source
	NOx	g/bhp-hr	0.50	0.50	Vendor
	CO	g/bhp-hr	2.72	0.15	
	VOC	g/bhp-hr	1.50	0.30	
50000	Formaldehyde	g/bhp-hr	0.20	0.02	
75070	Acetaldehyde	lb/MMBtu	0.0836	0.0836	AP-42
107028	Acrolein	lb/MMBtu	0.0514	0.0514	
67561	Methanol	lb/MMBtu	0.0250	0.0250	

Emission factors are based on a Brake-Specific Fuel Consumption Factor of 7500 Btu/hp-hr, a site-rated horsepower value of 1875, and a fuel heat value of 1130 Btu/scf.

Point 010:

CAS	Pollutant	Units	Emission Factors - Uncontrolled	Emission Factors - Controlled	Emission Factor Source
	NOx	g/bhp-hr	0.50	0.50	Vendor
	CO	g/bhp-hr	2.43	0.20	
	VOC	g/bhp-hr	0.91	0.36	
50000	Formaldehyde	g/bhp-hr	0.43	0.035	
75070	Acetaldehyde	lb/MMBtu	0.0836	0.0836	AP-42
107028	Acrolein	lb/MMBtu	0.0514	0.0514	
67561	Methanol	lb/MMBtu	0.0250	0.0250	

Emission factors are based on a Brake-Specific Fuel Consumption Factor of 8256 Btu/hp-hr, a site-rated horsepower value of 1380, and a fuel heat value of 1130 Btu/scf.

- 6) In accordance with C.R.S. 25-7-114.1, each Air Pollutant Emission Notice (APEN) associated with this permit is valid for a term of five years from the date it was received by the Division. A revised APEN shall be submitted no later than 30 days before the five-year term expires. Please refer to the most recent annual fee invoice to determine the APEN expiration date for each emissions point associated with this permit. For any questions regarding a specific expiration date call the Division at (303)-692-3150.
- 7) This engine is subject to 40 CFR, Part 60, **Subpart JJJJ—Standards of Performance for Stationary Spark Ignition Internal Combustion Engines** (See January 18, 2008 Federal Register posting - effective March 18, 2008). This rule has not yet been incorporated into Colorado Air Quality Control Commission's Regulation No. 6. A copy of the complete subpart is available on the EPA website at: <http://www.epa.gov/ttn/atw/area/fr18ja08.pdf>
- 8) This engine is subject to 40 CFR, Part 63, Subpart ZZZZ - **National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines**. (See January 18, 2008 Federal Register posting - effective March 18, 2008). The January 18, 2008 amendments to include requirements for area sources and engines ≤ 500 hp located at major sources have not yet been incorporated into Colorado Air Quality Control Commission's Regulation No. 8. A copy of the complete subpart is available on the EPA website at: <http://www.epa.gov/ttn/atw/area/fr18ja08.pdf> Additional information regarding area source standards can be found on the EPA website at: <http://www.epa.gov/ttn/atw/area/arearules.html>
- 9) This engine is subject to 40 CFR, Part 63, Subpart ZZZZ - **National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines** (See August 20, 2010 Federal Register posting - effective October 19, 2010). The August 20, 2010 amendments to include requirements for existing engines located at area sources and existing engines ≤ 500 hp located at major sources have not yet been incorporated into Colorado Air Quality Control Commission's Regulation No. 8. A copy of the complete subpart is available on the EPA website at: <http://www.epa.gov/ttn/atw/rice/fr20au10.pdf> Additional information regarding area source standards can be found on the EPA website at: <http://www.epa.gov/ttn/atw/area/arearules.html>
- 10) This permit fulfills the requirement to hold a valid permit reflecting the glycol dehydration unit and associated control device per the Colorado Oil and Gas Conservation Commission rule 805b(2)(B) when applicable.

11) This facility is classified as follows:

Applicable Requirement	Status
Operating Permit	Synthetic Minor Source of: VOC, CO, Benzene, Toluene, Xylenes, Formaldehyde, total HAPs
NANSR	Synthetic Minor Source of: VOC
MACT HH	Area Source Requirements: Applicable
MACT ZZZZ	Area Source Requirements: Applicable
NSPS OOOOa	Area Source Requirements: Applicable

12) Full text of the Title 40, Protection of Environment Electronic Code of Federal Regulations can be found at the website listed below:

<http://ecfr.gpoaccess.gov/>

Part 60: Standards of Performance for New Stationary Sources		
NSPS	60.1-End	Subpart A - Subpart KKKK
NSPS	Part 60, Appendixes	Appendix A - Appendix I
Part 63: National Emission Standards for Hazardous Air Pollutants for Source Categories		
MACT	63.1-63.599	Subpart A - Subpart Z
MACT	63.600-63.1199	Subpart AA - Subpart DDD
MACT	63.1200-63.1439	Subpart EEE - Subpart PPP
MACT	63.1440-63.6175	Subpart QQQ - Subpart YYYY
MACT	63.6580-63.8830	Subpart ZZZZ - Subpart MMMMM
MACT	63.8980-End	Subpart NNNNN - Subpart XXXXXX

ALTERNATIVE OPERATING SCENARIOS RECIPROCATING INTERNAL COMBUSTION ENGINES

December 10, 2008

The following Alternative Operating Scenario (AOS) for the temporary and permanent replacement of natural gas fired reciprocating internal combustion engines has been reviewed in accordance with the requirements of Regulation No. 3., Part A, Section IV.A, Operational Flexibility-Alternative Operating Scenarios, Regulation No. 3, Part B, Construction Permits, and Regulation No. 3, Part D, Major Stationary Source New Source Review and Prevention of Significant Deterioration, and it has been found to meet all applicable substantive and procedural requirements. This permit incorporates and shall be considered a Construction Permit for any engine replacement performed in accordance with this AOS, and the permittee shall be allowed to perform such engine replacement without applying for a revision to this permit or obtaining a new Construction Permit.

A.1 Engine Replacement

The following AOS is incorporated into this permit in order to deal with a compressor engine breakdown or periodic routine maintenance and repair of an existing onsite engine that requires the use of either a temporary or permanent replacement engine. "Temporary" is defined as in the same service for 90 operating days or less in any 12 month period. "Permanent" is defined as in the same service for more than 90 operating days in any 12 month period. The 90 days is the total number of days that the engine is in operation. If the engine operates only part of a day, that day shall count as a single day towards the 90-day total. The compliance demonstrations and any periodic monitoring required by this AOS are in addition to any compliance demonstrations or periodic monitoring required by this permit.

All replacement engines are subject to all federally applicable and state-only requirements set forth in this permit (including monitoring and record keeping).

The results of all tests and the associated calculations required by this AOS shall be submitted to the Division within 30 calendar days of the test or within 60 days of the test if such testing is required to demonstrate compliance with NSPS or MACT requirements. Results of all tests shall be kept on site for five (5) years and made available to the Division upon request.

The permittee shall maintain a log on-site and contemporaneously record the start and stop date of any engine replacement, the manufacturer, date of manufacture, model number, horsepower, and serial number of the engine(s) that are replaced during the term of this permit, and the manufacturer, model number, horsepower, and serial number of the replacement engine. In addition to the log, the permittee shall maintain a copy of all Applicability Reports required under section A.1.2 and make them available to the Division upon request.

A.1.1 The permittee may **temporarily** replace an existing compressor engine that is subject to the emission limits set forth in this permit with an engine that is of the same manufacturer, model, and horsepower or a different manufacturer, model, or horsepower as the existing engine without modifying this permit, so long as the emissions from the temporary replacement engine comply with the emission limitations for the existing permitted engine as determined in section A.2. Measurement of emissions from the temporary replacement engine shall be made as set forth in section A.2.

A.1.2 The permittee may **permanently** replace the existing compressor engine with an engine that is of the same manufacturer, model and horsepower without modifying this permit so long as the emissions from the permanent replacement engine comply with 1) the permitted annual emission limitations for the existing engine, 2) any permitted short-term emission limitations for the existing permitted engine, and 3) the applicable emission limitations as set forth in the Applicability Report submitted to the Division with the Air Pollutant Emissions Notice (APEN) for the replacement engine (see

<http://www.cdphe.state.co.us/ap/oilgaspermitting.html> for example applicability report formats). Measurement of emissions from the permanent replacement engine and compliance with the applicable emission limitations shall be made as set forth in section 2.2.

An Air Pollutant Emissions Notice (APEN) that includes the specific manufacturer, model and serial number and horsepower of the permanent replacement engine shall be filed with the Division for the permanent replacement engine within 14 calendar days of commencing operation of the replacement engine. The APEN shall be accompanied by the appropriate APEN filing fee, a cover letter explaining that the permittee is exercising an alternative operating scenario and is installing a permanent replacement engine, and a copy of the relevant Applicability Reports for the replacement engine. Example Applicability Reports can be found at <https://www.colorado.gov/pacific/cdphe/alternate-operating-scenario-aos-reporting-forms>. This submittal shall be accompanied by a certification from a person legally authorized to act on behalf of the source indicating that "based on the information and belief formed after reasonable inquiry, the statements and information included in the submittal are true, accurate and complete".

This AOS cannot be used for permanent engine replacement of a grandfathered or permit exempt engine or an engine that is not subject to emission limits.

The permittee shall agree to pay fees based on the normal permit processing rate for review of information submitted to the Division in regard to any permanent engine replacement.

A.2 Portable Analyzer Testing

Note: In some cases there may be conflicting and/or duplicative testing requirements due to overlapping Applicable Requirements. In those instances, please contact the Division Field Services Unit to discuss streamlining the testing requirements.

Note that the testing required by this Condition may be used to satisfy the periodic testing requirements specified by the permit for the relevant time period (i.e. if the permit requires quarterly portable analyzer testing, this test conducted under the AOS will serve as the quarterly test and an additional portable analyzer test is not required for another three months).

The permittee may conduct a reference method test, in lieu of the portable analyzer test required by this Condition, if approved in advance by the Division.

The permittee shall measure nitrogen oxide (NOX) and carbon monoxide (CO) emissions in the exhaust from the replacement engine using a portable flue gas analyzer within seven (7) calendar days of commencing operation of the replacement engine.

All portable analyzer testing required by this permit shall be conducted using the Division's Portable Analyzer Monitoring Protocol (ver March 2006 or newer) as found on the Division's website at: <http://www.cdphe.state.co.us/ap/down/portanalyzeproto.pdf>

Results of the portable analyzer tests shall be used to monitor the compliance status of this unit.

For comparison with an annual (tons/year) or short term (lbs/unit of time) emission limit, the results of the tests shall be converted to a lb/hr basis and multiplied by the allowable operating hours in the month or year (whichever applies) in order to monitor compliance. If a source is not limited in its hours of operation the test results will be multiplied by the maximum number of hours in the month or year (8760), whichever applies.

For comparison with a short-term limit that is either input based (lb/mmBtu), output based (g/hp-hr) or concentration based (ppmvd @ 15% O₂) that the existing unit is currently subject to or the

replacement engine will be subject to, the results of the test shall be converted to the appropriate units as described in the above-mentioned Portable Analyzer Monitoring Protocol document.

If the portable analyzer results indicate compliance with both the NOX and CO emission limitations, in the absence of credible evidence to the contrary, the source may certify that the engine is in compliance with both the NOX and CO emission limitations for the relevant time period.

Subject to the provisions of C.R.S. 25-7-123.1 and in the absence of credible evidence to the contrary, if the portable analyzer results fail to demonstrate compliance with either the NOX or CO emission limitations, the engine will be considered to be out of compliance from the date of the portable analyzer test until a portable analyzer test indicates compliance with both the NOX and CO emission limitations or until the engine is taken offline.

A.3 Applicable Regulations for Permanent Engine Replacements

A.3.1 Reasonably Available Control Technology (RACT): Reg 3, Part B § II.D.2

All permanent replacement engines that are located in an area that is classified as attainment/maintenance or nonattainment must apply Reasonably Available Control Technology (RACT) for the pollutants for which the area is attainment/maintenance or nonattainment. Note that both VOC and NOX are precursors for ozone. RACT shall be applied for any level of emissions of the pollutant for which the area is in attainment/maintenance or nonattainment, except as follows:

In the Denver Metropolitan PM10 attainment/maintenance area, RACT applies to PM10 at any level of emissions and to NOX and SO2, as precursors to PM10, if the potential to emit of NOX or SO2 exceeds 40 tons/yr.

For purposes of this AOS, the following shall be considered RACT for natural-gas fired reciprocating internal combustion engines:

- VOC: The emission limitations in NSPS JJJJ
- CO: The emission limitations in NSPS JJJJ
- NOX: The emission limitations in NSPS JJJJ
- SO2: Use of natural gas as fuel
- PM10: Use of natural gas as fuel

As defined in 40 CFR Part 60 Subparts GG (§ 60.331) and 40 CFR Part 72 (§ 72.2), natural gas contains 20.0 grains or less of total sulfur per 100 standard cubic feet.

A.3.2 Control Requirements and Emission Standards: Regulation No. 7, Sections XVI. and XVII.E (State-Only conditions).

Control Requirements: Section XVI

Any permanent replacement engine located within the boundaries of an ozone nonattainment area is subject to the applicable control requirements specified in Regulation No. 7, section XVI, as specified below:

Rich burn engines with a manufacturer's design rate greater than 500 hp shall use a non-selective catalyst and air fuel controller to reduce emission.

Lean burn engines with a manufacturer's design rate greater than 500 hp shall use an oxidation catalyst to reduce emissions.

The above emission control equipment shall be appropriately sized for the engine and shall be operated and maintained according to manufacturer specifications.

The source shall submit copies of the relevant Applicability Reports required under Condition A.1.2.

Emission Standards: Section XVII.E - State-only requirements

Any permanent engine that is either constructed or relocated to the state of Colorado from another state, after the date listed in the table below shall operate and maintain each engine according to the manufacturer's written instructions or procedures to the extent practicable and consistent with technological limitations and good engineering and maintenance practices over the entire life of the engine so that it achieves the emission standards required in the table below:

Max Engine HP	Construction or Relocation Date	Emission Standards in G/hp-hr		
		NO _x	CO	VOC
100<Hp<500	January 1, 2008	2.0	4.0	1.0
	January 1, 2011	1.0	2.0	0.7
500≤Hp	July 1, 2007	2.0	4.0	1.0
	July 1, 2010	1.0	2.0	0.7

The source shall submit copies of the relevant Applicability Reports required under Condition A.1.2

A.3.3 NSPS for spark ignition internal combustion engines: 40 CFR 60, Subpart JJJJ

A permanent replacement engine that is manufactured on or after 7/1/09 for emergency engines greater than 25 hp, 7/1/2008 for engines less than 500 hp, 7/1/2007 for engines greater than or equal to 500 hp except for lean burn engines greater than or equal to 500 hp and less than 1,350 hp, and 1/1/2008 for lean burn engines greater than or equal to 500 hp and less than 1,350 hp are subject 40 CFR 60, Subpart JJJJ. An analysis of applicable monitoring, recordkeeping, and reporting requirements for the permanent engine replacement shall be included in the Applicability Reports required under Condition A.1.2. Any testing required by the NSPS is in addition to that required by this AOS. Note that the initial test required by NSPS Subpart JJJJ can serve as the testing required by this AOS under Condition A.2, if approved in advance by the Division, provided that such test is conducted within the time frame specified in Condition A.2.

Note that under the provisions of Regulation No. 6, Part B, section I.B. that Relocation of a source from outside of the State of Colorado into the State of Colorado is considered to be a new source, subject to the requirements of Regulation No. 6 (i.e., the date that the source is first relocated to Colorado becomes equivalent to the manufacture date for purposes of determining the applicability of NSPS JJJJ requirements).

However, as of November 1, 2008 the Division has not yet adopted NSPS JJJJ. Until such time as it does, any engine subject to NSPS will be subject only under Federal law. Once the Division adopts NSPS JJJJ, there will be an additional step added to the determination of the NSPS. Under the provisions of Regulation No. 6, Part B, § I.B (which is referenced in Part A), any engine relocated from outside of the State of Colorado into the State of Colorado is considered to be a new source, subject to the requirements of NSPS JJJJ.

A.3.4 Reciprocating internal combustion engine (RICE) MACT: 40 CFR Part 63, Subpart ZZZZ

A.3.4.1 Area Source for HAPs

A permanent replacement engine located at an area source that commenced construction or reconstruction after June 12, 2006 as defined in § 63.2, will meet the requirements of 40 CFR Part 63, Subpart ZZZZ by meeting the requirements of 40 CFR Part 60, Subpart JJJJ. An analysis of the applicable monitoring, recordkeeping, and reporting requirements for the permanent engine replacement shall be included in the Applicability Reports required under Condition A.1.2. Any testing required by the MACT is in addition to that required by this AOS. Note that the initial test required by the MACT can serve as the testing required by this AOS under Condition A.2, if approved in advance by the Division, provided that such test is conducted within the time frame specified in Condition A.2.

A.4.3.2 Major source for HAPs

A permanent replacement engine that is located at major source is subject to the requirements in 40 CFR Part 63 Subpart ZZZZ as follows:

Existing, new or reconstructed spark ignition 4 stroke rich burn engines with a site rating of more than 500 hp are subject to the requirements in 40 CFR Part 63 Subpart ZZZZ.

New or reconstructed (construction or reconstruction commenced after 12/19/02) 2 stroke and 4 stroke lean burn engines with a site rating of more than 500 hp are subject to the requirements in 40 CFR Part 63 Subpart ZZZZ.

New or reconstructed (construction or reconstruction commenced after 6/12/06) 4 stroke lean burn engines with a site rating of greater than or equal to 250 but less or equal to 500 hp and were manufactured on or after 1/1/08 are subject to the requirements in 40 CFR Part 63 Subpart ZZZZ.

New or reconstructed (construction or reconstruction commenced after 6/12/06) 2 stroke lean burn or 4 stroke rich burn engines with a site rating of 500 hp or less will meet the requirements of 40 CFR 63, Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart JJJJ.

New or reconstructed (construction or reconstruction commenced after 6/12/06) 4 stroke lean burn engines with a site rating of less than 250 hp will meet the requirements of 40 CFR 63, Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart JJJJ.

An analysis of the applicable monitoring, recordkeeping, and reporting requirements for the permanent engine replacement shall be included in the Applicability Reports required under Condition A.1.2. Any testing required by the MACT is in addition to that required by this AOS. Note that the initial test required by the MACT can serve as the testing required by this AOS under Condition A.2, if approved in advance by the Division, provided that such test is conducted within the time frame specified in Condition A.2.

A.3.5 Additional Sources

The replacement of an existing engine with a new engine is viewed by the Division as the installation of a new emissions unit, not "routine replacement" of an existing unit. The AOS is therefore essentially an advanced construction permit review. The AOS cannot be used for additional new emission points for any site; an engine that is being installed as an entirely new emission point and not as part of an AOS-approved replacement of an existing onsite engine has to go through the appropriate Construction/Operating permitting process prior to installation.

Appendix C

Location --
 Source --
 Project No. --
 Run No. --
 Method --

Meter Pressure (Pm), in. Hg

$$P_m = P_b + \frac{\Delta H}{13.6}$$

where,

Pb -- = barometric pressure, in. Hg
 ΔH 0.000 = pressure differential of orifice, in. H₂O
 Pm -- = in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$P_s = P_b + \frac{P_g}{13.6}$$

where,

Pb -- = barometric pressure, in. Hg
 P_g -- = static pressure, in. H₂O
 Ps -- = in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.647 \times Y \times V_m \times P_m}{T_m}$$

where,

Y 0.000 = meter correction factor
 Vm -- = meter volume, cf
 Pm -- = absolute meter pressure, in. Hg
 Tm -- = absolute meter temperature, °R
 Vmstd -- = dscf

Standard Wet Volume (Vwstd), scf

$$V_{wstd} = 0.04707 \times V_{lc}$$

where,

Vlc -- = volume of H₂O collected, ml
 Vwstd -- = scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWS_{sat} = \frac{10^{6.47 \left(\frac{2.227}{T_s + 262} \right)}}{P_s}$$

where,

Ts -- = stack temperature, °F
 Ps -- = absolute stack gas pressure, in. Hg
 BWSsat -- = dimensionless

Moisture Fraction (BWSmsd), dimensionless (measured)

$$BWS = \frac{V_{wstd}}{(V_{wstd} + V_{mstd})}$$

where,

Vwstd -- = standard wet volume, scf
 Vmstd -- = standard meter volume, dscf
 BWS -- = dimensionless

Moisture Fraction (BWS), dimensionless

$$BWS = BWS_{msd} \text{ unless } BWS_{sat} < BWS_{msd}$$

where,

BWSsat -- = moisture fraction (theoretical at saturated conditions)
 BWSmsd -- = moisture fraction (measured)
 BWS -- = dimensionless

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \% CO_2) + (0.32 \times \% O_2) + (0.38 (100 - \% CO_2 - \% O_2))$$

where,

CO₂ -- = carbon dioxide concentration, %
 O₂ -- = oxygen concentration, %
 Md -- = lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md (1 - BWS) + 18 (BWS)$$

where,

Md -- = molecular weight (DRY), lb/lb mol
 BWS -- = moisture fraction, dimensionless
 Ms -- = lb/lb mol

Location --
 Source --
 Project No. --
 Run No. --
 Method --

Average Velocity (Vs), ft/sec

$$V_s = 85.49 \times C_p \times (\Delta P^{1/2}) \text{ inHg} \times \sqrt{\frac{T_s}{P_s \times M_s}}$$

where,

Cp -- = pitot tube coefficient
 $\Delta P^{1/2}$ -- = velocity head of stack gas, (in. H₂O)^{1/2}
 Ts -- = absolute stack temperature, °R
 Ps -- = absolute stack gas pressure, in. Hg
 Ms -- = molecular weight of stack gas, lb/lb mol
 Vs -- = ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Q_a = 60 \times V_s \times A_s$$

where,

Vs -- = stack gas velocity, ft/sec
 As -- = cross-sectional area of stack, ft²
 Qa -- = acfm

Average Stack Gas Flow at Standard Conditions (Qsw), scfm

$$Q_{sw} = 17.647 \times Q_a \times \frac{P_s}{T_s}$$

where,

Qa -- = average stack gas flow at stack conditions, acfm
 Ps -- = absolute stack gas pressure, in. Hg
 Ts -- = absolute stack temperature, °R
 Qsw -- = scfm

Average Stack Gas Flow at Standard Conditions (Qsfh), scfh

$$Q_{sfh} = 17.647 \times Q_a \times 60 \times \frac{P_s}{T_s}$$

where,

Qa -- = average stack gas flow at stack conditions, acfm
 Ps -- = absolute stack gas pressure, in. Hg
 Ts -- = absolute stack temperature, °R
 Qsfh -- = scfh

Average Stack Gas Flow at Standard Conditions (Qsd), dscfm

$$Q_{sd} = 17.647 \times Q_a \times (1 - BWS) \times \frac{P_s}{T_s}$$

where,

Qa -- = average stack gas flow at stack conditions, acfm
 BWS -- = moisture fraction
 Ps -- = absolute stack gas pressure, in. Hg
 Ts -- = absolute stack temperature, °R
 Qsd -- = dscfm

Dry Gas Meter Calibration Check (Yqa), dimensionless

$$Y_{qa} = \frac{F \cdot \left(\frac{\Theta}{V_m} \sqrt{\frac{0.0210 \times T_m \times 29}{\Delta H @ \times \left(P_b + \frac{\Delta H \text{ avg.}}{13.6} \right) \times M_d}} \sqrt{\Delta H \text{ avg.}} \right)}{Y} \times 100$$

where,

Y 0 = meter correction factor, dimensionless
 Θ 0 = run time, min.
 Vm -- = total meter volume, dcf
 Tm -- = absolute meter temperature, °R
 $\Delta H @$ 0 = orifice meter calibration coefficient, in. H₂O
 Pb -- = barometric pressure, in. Hg
 $\Delta H \text{ avg}$ 0.000 = average pressure differential of orifice, in. H₂O
 Md -- = molecular weight (DRY), lb/lb mol
 $(\Delta H)^{1/2}$ 0.000 = average squareroot pressure differential of orifice, (in. H₂O)^{1/2}
 Yqa -- = dimensionless

Location: _____
Source: _____
Project No.: _____
Run No./Method _____

Nitrogen Oxides Concentration @ 15% Oxygen (C_{NOx15}), ppmvd @ 15% O_2

$$C_{NOx15} = C_{NOx} \times \frac{20.9 - 15}{20.9 - C_{O2}}$$

where,

C_{NOx} _____ = NO_x concentration, ppmvd
 C_{O2} _____ = O₂ concentration, %
 C_{NOx15} _____ = ppmvd @ 15% O₂

Nitrogen Oxides Emission Rate (ER_{NOx}), lb/hr

$$ER_{NOx} = \frac{C_{NOx} \times MW \times Qs \times 60 \times 28.32}{24.04 \times 1.0 E + 06 \times 454}$$

where,

C_{NOx} _____ = NO_x concentration, ppmvd
MW 46.0 _____ = NO_x (as NO₂) molecular weight, g/g-mole
Qs _____ = stack gas volumetric flow rate at standard conditions, dscfm
 ER_{NOx} _____ = lb/hr

Nitrogen Oxides Emission Factor (EF_{NOx}), g/hp-hr

$$EF_{NOx} = \frac{ER_{NOx} \times 454}{EBW}$$

where,

ER_{NOx} _____ = NO_x emission rate, lb/hr
EBW _____ = engine brake work, HP
 EF_{NOx} _____ = g/HP-hr

Location: _____
 Source: _____
 Project No.: _____
 Run No./Method _____

Carbon Monoxide Concentration @ 15% Oxygen ($C_{CO_{15}}$), ppmvd @ 15% O₂

$$C_{CO_{15}} = C_{CO} \times \frac{20.9 - 15}{20.9 - C_{O_2}}$$

where,

C_{CO} _____ = CO concentration, ppmvd
 C_{O_2} _____ = O₂ concentration, %
 $C_{CO_{15}}$ _____ = ppmvd @ 15% O₂

Carbon Monoxide Emission Rate (ER_{CO}), lb/hr

$$ER_{CO} = \frac{C_{CO} \times MW \times Q_s \times 60 \times 28.32}{24.04 \times 1.0 E + 06 \times 454}$$

where,

C_{CO} _____ = CO concentration, ppmvd
 MW _____ = CO molecular weight, g/g-mole
 Q_s _____ = stack gas volumetric flow rate at standard conditions, dscfm
 ER_{CO} _____ = lb/hr

Carbon Monoxide Emission Factor (EF_{CO}), g/hp-hr

$$EF_{CO} = \frac{ER_{CO} \times 454}{EBW}$$

where,

ER_{CO} _____ = CO emission rate, lb/hr
 EBW _____ = engine brake work, HP
 EF_{CO} _____ = g/HP-hr

Location: _____
 Source: _____
 Project No.: _____
 Run No./Method Method 25A _____

Total Hydrocarbons Concentration (C_{THC}) as (C3H8), ppmvd

$$C_{THC} = \frac{C_{THCw}}{1 - BWS}$$

where,

C_{THCw} -- = THC concentration (as C3H8), ppmvw
 BWS -- = moisture fraction, unitless
 C_{THC} -- = ppmvd

NMVOC Concentration @ 15% Oxygen ($C_{NMVOC@15}$) (as C3H8), ppmvd @ 15% O₂

$$C_{NMVOC@15} = C_{NMVOC} \times \frac{20.9 - 15}{20.9 - C_{O_2}}$$

where,

C_{NMVOC} -- = NMVOC concentration (as C3H8), ppmvd
 C_{O_2} -- = O₂ concentration, %
 $C_{NMVOC@15}$ -- = ppmvd @ 15% O₂

NMVOC Compounds Rate (ER_{NMVOC}) (as C3H8), lb/hr

$$ER_{NMVOC} = \frac{C_{NMVOC} \times MW \times Qs \times 60 \times 28.32}{24.04 \times 1.0E+06 \times 454}$$

where,

C_{NMVOC} -- = NMVOC concentration (C3H8), ppmvd
 MW 44.1 = molecular weight, g/g-mole
 Qs -- = stack gas volumetric flow rate at standard conditions, dscfm
 ER_{NMVOC} -- = lb/hr

NMVOC Emission Factor (EF_{NMVOC}) (as C3H8), g/hp-hr

$$EF_{NMVOC} = \frac{ER_{NMVOC} \times 454}{EBW}$$

where,

ER_{NMVOC} -- = NMVOC emission rate (as C3H8), lb/hr
 EBW -- = engine brake work, HP
 EF_{NMVOC} -- = g/HP-hr

Location: --
Source: --
Project No.: --
Run No. /Method: --

Formaldehyde Concentration ($C_{CH_2O_d}$), ppmvd

$$C_{CH_2O} = \frac{C_{CH_2O_w}}{1 - BWS}$$

where,

$C_{CH_2O_w}$ -- = CH₂O concentration, ppmvw
BWS -- = moisture fraction, unitless
 $C_{CH_2O_d}$ -- = ppmvd

Formaldehyde Concentration @ 15% Oxygen ($C_{CH_2O_{c15}}$), ppmvd @ 15% O₂

$$C_{CH_2O_{c15}} = C_{CH_2O} \times \frac{20.9 - 15.0}{20.9 - C_{O_2}}$$

where,

C_{CH_2O} -- = CH₂O concentration, ppmvd
 C_{O_2} -- = O₂ concentration, %
 $C_{CH_2O_{c15}}$ -- = ppmvd @ 15% O₂

Formaldehyde Emission Rate (ER_{CH_2O}), lb/hr

$$ER_{CH_2O} = \frac{C_{CH_2O} \times MW \times Q_s \times 60 \times 28.32}{24.04 \times 1.0E+06 \times 454}$$

where,

C_{CH_2O} -- = CH₂O concentration, ppmvd
MW 30.031 -- = molecular weight, g/g-mole
Q_s -- = stack gas volumetric flow rate at standard conditions, dscfm
 ER_{CH_2O} -- = lb/hr

Formaldehyde Emission Rate ($ER_{CH_2O_{TPY}}$), ton/yr

$$ER_{CH_2O_{TPY}} = ER_{CH_2O} \times \frac{8,760}{2.0E+08}$$

where,

ER_{CH_2O} -- = CH₂O emission rate, lb/hr
 $ER_{CH_2O_{TPY}}$ -- = ton/yr

Formaldehyde Emission Factor ($EF_{CH_2O_{O2d}}$), lb/MMBtu

$$EF_{CH_2O_{O2d}} = C_{CH_2O} \times K \times F_d \times \frac{20.9}{20.9 - C_{O_2}}$$

where,

C_{CH_2O} -- = CH₂O concentration, ppmvd
K 7.0798E-03 -- = constant, lb/dscf · ppm
F_d -- = fuel factor, dscf/MMBtu
 C_{O_2} -- = O₂ concentration, %
 $EF_{CH_2O_{O2d}}$ -- = lb/MMBtu

Appendix D

Stack Parameters	
------------------	--

^a Higher Number is for Rectangular Stacks or Ducts

24 or 25^a

20

16

Stack Diameter > 0.61 m (24 in.)

12

Stack Diameter = 0.30 to 0.61 m (12-24 in.)

* From Point of Any Type of Disturbance (Bend, Expansion, Contraction, etc.)

Disturbance

Measurement Site

Disturbance

	DUCT
--	------

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	--	--
2	50.0	--	--
3	83.3	--	--
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
 A = -- ft.
 B = -- ft.
 Depth of Duct = -- in.

Downstream
Disturbance

A

Location --
Source --
Project No. --

Run No.	1		2		3	
Date			--		--	
Status	VALID		VALID		VALID	
Start Time						
Stop Time						
Leak Check						
Traverse Point	ΔP (in. WC)	Ts (°F)	ΔP (in. WC)	Ts (°F)	ΔP (in. WC)	Ts (°F)

						Average
Square Root of ΔP , (in. WC) ^{1/2}	(ΔP) ^{1/2}	--	--	--	--	--
Average ΔP , in. WC	(ΔP)	--	--	--	--	--
Pitot Tube Coefficient	(Cp)	--	--	--	--	--
Barometric Pressure, in. Hg	(Pb)	--	--	--	--	--
Static Pressure, in. WC	(Pg)	--	--	--	--	--
Stack Pressure, in. Hg	(Ps)	--	--	--	--	--
Average Temperature, °F	(Ts)	--	--	--	--	--
Average Temperature, °R	(Ts)	--	--	--	--	--
Moisture Fraction	(BWS)	--	--	--	--	--
CO2 Concentration, %	(CO2)	--	--	--	--	--
O2 Concentration, %	(O2)	--	--	--	--	--
Molecular Weight, lb/lb-mole (dry)	(Md)	--	--	--	--	--
Molecular Weight, lb/lb-mole (wet)	(Ms)	--	--	--	--	--
Velocity, ft/sec	(Vs)	--	--	--	--	--
VFR at stack conditions, acfm	(Qa)	--	--	--	--	--
VFR at standard conditions, scfh	(Qsw)	--	--	--	--	--
VFR at standard conditions, scfm	(Qsw)	--	--	--	--	--
FR at standard conditions, dscfm	(Qsd)	--	--	--	--	--

Calibration Data

Location: - _____
 Source: -- _____
 Project No.: -- _____
 Date: -- _____

Parameter	O ₂ - Outlet	CO - Outlet
Expected Average Concentration		
Span Between		
Low	-	-
High	-	-
Desired Span		
Low Range Gas		
Low	NA	NA
High	NA	NA
Mid Range Gas		
Low	-	-
High	-	-
High Range Gas		
Low	NA	NA
High	NA	NA
Actual Concentration (% or ppm)		
Zero	0.0	0.0
Low	NA	NA
Mid		
High	-	-
Response Time (seconds)		
Instrument Response (% or ppm)		
Zero		
Low	NA	NA
Mid		
High		
Performance (% of Span or Cal. Gas Conc.)		
Zero	-	-
Low	NA	NA
Mid	-	-
High	-	-
Status		
Zero	-	-
Low	NA	NA
Mid	-	-
High	-	-

Bias/Drift Determinations

Location: - _____
Source: -- _____
Project No.: -- _____

Parameter			O ₂ - Outlet	CO ₂ - Outlet
Run 1	Date	--		
Span Value			-	-
Instrument Zero Cal Response			-	-
Instrument Mid Cal Response			-	-
Pretest System Zero Response			-	-
Posttest System Zero Response			-	-
Pretest System Mid Response			-	-
Posttest System Mid Response			-	-
Bias (%)				
Pretest Zero			-	-
Posttest Zero			-	-
Pretest Span			-	-
Posttest Span			-	-
Drift (%)				
Zero			-	-
Mid			-	-
Run 2	Date	--		
Span Value			-	-
Instrument Zero Cal Response			-	-
Instrument Mid Cal Response			-	-
Pretest System Zero Response			-	-
Posttest System Zero Response			-	-
Pretest System Mid Response			-	-
Posttest System Mid Response			-	-
Bias (%)				
Pretest Zero			-	-
Posttest Zero			-	-
Pretest Span			-	-
Posttest Span			-	-
Drift (%)				
Zero			-	-
Mid			-	-
Run 3	Date	--		
Span Value			-	-
Instrument Zero Cal Response			-	-
Instrument Mid Cal Response			-	-
Pretest System Zero Response			-	-
Posttest System Zero Response			-	-
Pretest System Mid Response			-	-
Posttest System Mid Response			-	-
Bias (%)				
Pretest Zero			-	-
Posttest Zero			-	-
Pretest Span			-	-
Posttest Span			-	-
Drift (%)				
Zero			-	-
Mid			-	-

Location: _____
 Source: _____
 Project No.: _____

Parameter	O ₂	NO _x
Make	--	--
Model	--	--
S/N		
Operating Range		
Cylinder Number ID		
LOW		
MID		
HIGH		

Location	--
Source	--
Project No.	--
Date	--

Spike Cylinder ID	--	Component
Spike Gas concentration	--	--
Tracer Cylinder ID	--	Component
Tracer Gas concentration	--	SF6
Instrument ID	0	

Direct Spike Values

Date	Time	File	Temperature (C)	Pressure	Spike (ppm)	Tracer (ppm)
Average					--	--

Native Values

Date	Time	File	Temperature (C)	Pressure	Spike (ppm)	Tracer (ppm)
Average					--	--

Spiked values

Date	Time	File	Temperature (C)	Pressure	Spike (ppm)	Tracer (ppm)
Average					--	--

Dilution Factor
--

Calculated Spike
--

Spike Recovery
--

Location--

Source0

Project No.--

Date

Ethylene Cylinder ID--

Concentration (ppmv)--

Instrument ID0

CTS 1	--	CTS 7	--	AVERAGE	--	Greatest Deviation from average
CTS 2	--	CTS 8	--	MAX	--	--
CTS 3	--	CTS 9	--	deviation	--	Agreement with Assumed Pathlength
CTS 4	--	CTS 10	--	MIN	--	--
CTS 5	--	CTS 11	--	deviation	--	--
CTS 6	--	CTS 12	--			

CTS 1						CTS 7					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene
CTS 2						CTS 8					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene
CTS 3						CTS 9					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene
CTS 4						CTS 10					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene
CTS 5						CTS 11					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene
CTS 6						CTS 12					
Date	Time	File	Temperature (C	Pressure	Ethylene	Date	Time	File	Temperature (C	Pressure	Ethylene

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